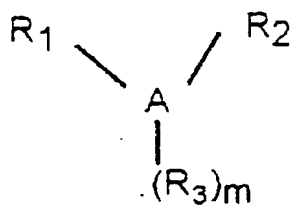


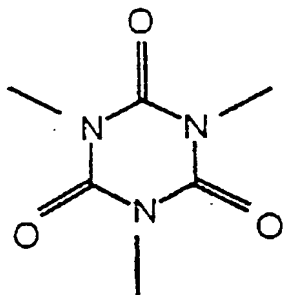
CLAIMS

1. Process for preparing a tricondensate polyfunctional isocyanate composition, preferably comprising at least one isocyanurate and/or biuret group, which consists in adding to a tricondensate polyfunctional isocyanate, or to a mixture of different tricondensate polyfunctional isocyanates, obtained by (cyclo)condensation, in particular (cyclo)trimerization of one or more identical or different isocyanate monomers and optionally of another monomer, an allophanate of one or more identical or different isocyanates, or a mixture of different allophanates, the isocyanates or mixtures of isocyanate monomers used to prepare the polyfunctional isocyanate(s) being identical to or different from the isocyanate(s) or the mixture of isocyanates used to prepare the allophanate(s).

2. Process according to claim 1, characterized in that the tricondensate polyfunctional isocyanates correspond to the following general formula:

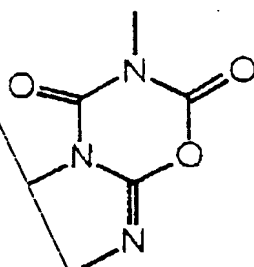


in which A represents  
- an isocyanurate group of formula



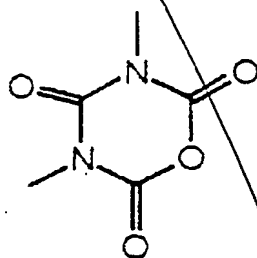
- one of its derivatives such as imino-oxadiazine-diones of the following formula:

5



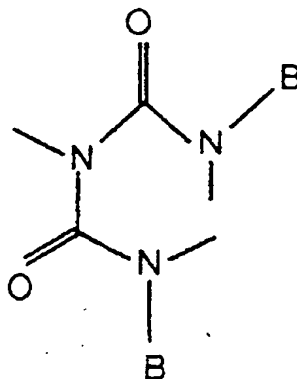
- one of its derivatives such as oxadiazine-triones of the following formula

10



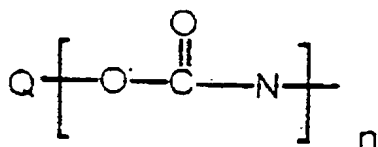
A

- a biuret group of formula



B being H or a hydrocarbon-based group, i.e. containing carbon and hydrogen as well as, optionally, other atoms (O, S, Si, etc.) preferably containing 1 to 20 carbon atoms; or

- a group of formula:



and in which  $R_1$ ,  $R_2$  and  $R_3$ , which may be identical or different, represent a hydrocarbon-based group, in particular an aliphatic, cycloaliphatic, heterocyclic or aromatic group, comprising a true or derived isocyanate function,

Q is a hydrocarbon-based group, preferably alkyl, as defined for  $R_1$  to  $R_3$ ,

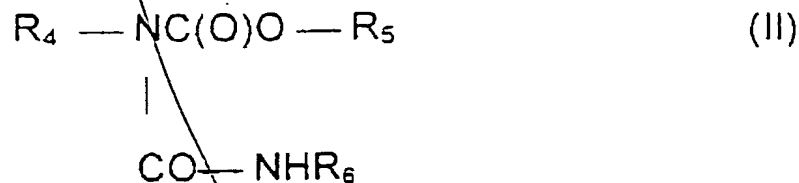
m is an integer from 0 to 2,

n is the integer 3 or 4.

3. Process according to either of the preceding claims, in which the tricondensate polyfunctional isocyanate composition comprises at least one true isocyanurate polyisocyanate.

4. Process according to any one of the preceding claims, in which the allophanates correspond to the general

formula II:



5 in which:

-  $R_4$  and  $R_6$ , which may be identical or different, represent a hydrocarbon-based group, in particular an aliphatic, cycloaliphatic, heterocyclic or aromatic group comprising a true or derived isocyanate function,

10 -  $R_5$  representing an alkyl group, i.e. the residue of an alcohol compound after removal of the OH function.

5. Process according to any one of the preceding claims, characterized in that a mixture of allophanates comprising a primary allophanate, preferably containing about 1/4, advantageously about 1/3 and preferably about 2/5 (by mass) of primary allophanate(s), is added to the tricondensate polyfunctional isocyanates.

6. Process according to any one of the preceding claims, characterized in that the mixture of allophanates comprises mono-, bis- and tris-allophanates, in an amount advantageously of at least 2/3, preferably of at least 75% and even more preferably of at least 90%, by weight relative to the total weight of the allophanate composition after removal of the unreacted monomers.

7. Process according to any one of the preceding claims, characterized in that the amount of bis-allophanate represents up to 10% or even up to 20% of the total weight of the allophanate composition.

8. Process according to any one of the preceding claims, characterized in that the amount of tris-allophanates is less than or equal to 30%, advantageously

20% and preferably 15% by weight, relative to the total weight of the composition.

9. Process according to any one of the preceding claims, characterized in that the ratio

5 
$$\frac{\text{bis-allophanate functions} + \text{tris-allophanate functions}}{\text{mono-allophanate functions}}$$
 is equal to or greater than 0.1, and can be up to 0.3 or even 0.5.

10 10. Process for preparing a low-viscosity tricondensate polyfunctional isocyanate composition, comprising the following steps a) and b) in any order:

15 a) (cyclo)condensation, in the presence of a catalyst, of one or more identical or different first isocyanate monomer(s) until the desired degree of conversion is obtained;

20 b) reaction of one or more second isocyanate monomer(s) which are identical to or different from one another and identical to or different from the first isocyanate monomer(s), with an alcohol to form a carbamate, the reaction optionally being catalyzed, and simultaneous or subsequent reaction of the carbamate with one or more isocyanate monomer(s) which are identical to or different from the previous monomers, to give an allophanate or mixture of allophanates;

25 and steps c) and d) in any order:

c) mixing the reaction product from step a) with all or some of the reaction product from step b); and optionally.

d) removing the isocyanate monomers.

30 11. Process according to claim 1 or 2, characterized in that the isocyanate(s) used for the (cyclo)condensation reaction is (are) identical to the isocyanate(s) used for the allophanatation reaction.

35 12. Process according to any one of the preceding claims, characterized in that the isocyanate(s) used for

the allophanatation reaction and the isocyanate(s) used for the cyclotrimerization reaction satisfy at least one, advantageously two and preferably three of the following conditions:

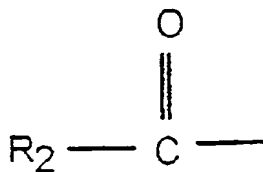
- 5 - at least one, advantageously two, of the NCO functions are linked to a hydrocarbon-based skeleton via a saturated ( $sp^3$ ) carbon;
- at least one, advantageously two, of the said saturated ( $sp^3$ ) carbons bears at least one, advantageously two, hydrogen(s).
- 10 - all the intermediate carbons via which the isocyanate functions are linked to the hydrocarbon-based skeleton are saturated ( $sp^3$ ) carbons which advantageously partially, preferably totally, bear a hydrogen, preferably two hydrogens.

13. Process according to any one of the preceding claims, characterized in that the alcohol is chosen from:

- aliphatic monoalcohols containing a  $C_1$ - $C_{10}$  linear chain;
- 20 - aliphatic monoalcohols containing a  $C_3$ - $C_{12}$  branch chain comprising not more than four secondary carbon atoms;
- diols containing a linear  $C_2$ - $C_{40}$  or branched  $C_3$ - $C_{40}$  chain;

of formula  $R-[O-CH(R_1)-CH_2]_n-OH$ , in which  $R_1$  represents H or an alkyl group, preferably a  $C_1$ - $C_8$  alkyl group, in particular methyl, or polyether, in particular  $-CH_2OR_{10}$ ,  $R_{10}$  representing a hydrocarbon-based chain, in particular polyoxyalkylene, preferably polyoxyethylene,  $n$  is an integer preferably from 1 to 50, and  $R$  is a linear or

30 branched  $C_1$ - $C_{20}$  alkyl group, or  $R$  is a group



with R<sub>2</sub> being a linear or branched C<sub>1</sub>-C<sub>20</sub> alkyl group;  
- silanols.

14. Process according to any one of claims 10 to 13, characterized in that the NCO/OH ratio in step b) is greater than 4, preferably greater than 6.

15. Process according to any one of the preceding claims, characterized in that at least about 25% by weight of the product from step b) is mixed with product from step a).

16. Reduced-viscosity tricondensate polyfunctional isocyanate composition comprising at least one true tricondensate polyfunctional isocyanate and at least one primary allophanate, the said composition being characterized in that it comprises less than 10%, advantageously less than 8%, even more advantageously less than 5%, preferably less than 4% and more preferably less than 3%, and even more preferably less than 2%, it being possible for it to go down to less than 1% of tricondensate allophanates relative to the total weight of the composition.

17. Reduced-viscosity tricondensate polyfunctional isocyanate composition, comprising at least one true tricondensate polyfunctional isocyanate and at least one allophanate, the said composition satisfying at least one, advantageously two, of the following conditions:

- a G ratio defined by:

True tricondensate polyisocyanates, obtained from the condensation of three identical or different isocyanate molecules not modified with carbamate or allophanate

G =

Sum of the polyisocyanate molecules bearing at least one tricondensate function obtained from the condensation of three identical or different isocyanate molecules.

generally greater than 0.3, preferably greater than 0.4 and advantageously greater than 0.5,

- an allophanate/allophanate + true trimer weight ratio of between 2.5% and 99%, advantageously between 3% and 60% and preferably between 3.5% and 40%,

- the tricondensates are obtained from a tricondensation reaction for which the degree of conversion of the identical or different isocyanate monomer(s) into tricondensate polyfunctional polyisocyanates contained in the composition is greater than 8%, preferably greater than 10% and advantageously greater than 15%,

- at least 1% and not more than 99%, preferably at least 2% and not more than 75%, of biuret is present, these amounts being given on a weight basis.

18. Tricondensate polyfunctional isocyanate composition according to either of claims 16 and 17, characterized in that the mixture of allophanates comprises mono-, bis- and tris-allophanates in an amount advantageously of at least 2/3, preferably of at least 75% and even more preferably of at least 90%, by weight relative to the total weight of the allophanate composition after removal of the unreacted monomers.

19. Tricondensate polyfunctional isocyanate composition according to one of claims 16 to 18, characterized in that the amount of bis-allophanate represents up to 10%, or even up to 20%, of the total weight of the allophanate composition.

20. Tricondensate polyfunctional isocyanate composition according to one of claims 16 to 19, characterized in that the amount of tris-allophanates is less than or equal to 30%, advantageously 20% and preferably 15%, by weight relative to the total weight of the composition.

21. Tricondensate polyfunctional isocyanate composition according to one of claims 16 to 20,

